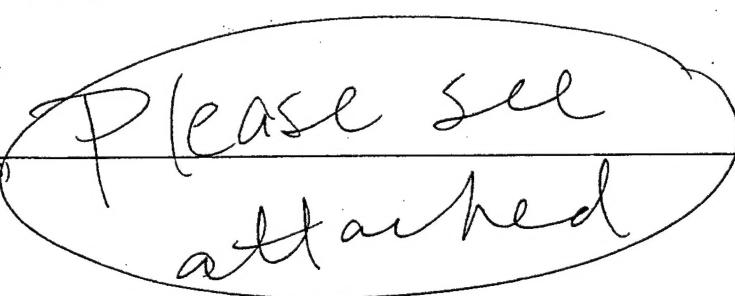
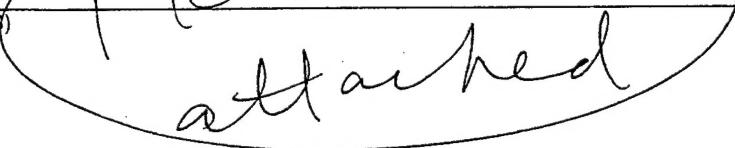
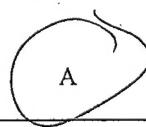


REPORT DOCUMENTATION PAGE

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23 02/11/02

MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

24 July 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-168**

C.T. Liu and J. Gonzalez (Clinical Micro Sensors), "Hybrid Experimental-Numerical J-Integral Analysis and Crack Growth Resistance of a Particulate Composite Material (Keynote Lecture)"

International Conf. on Computational Science and Engineering
(Puerto Vallarta, Mexico, 20-24 August 2001) (Deadline: 14 Aug 2001)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

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2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.

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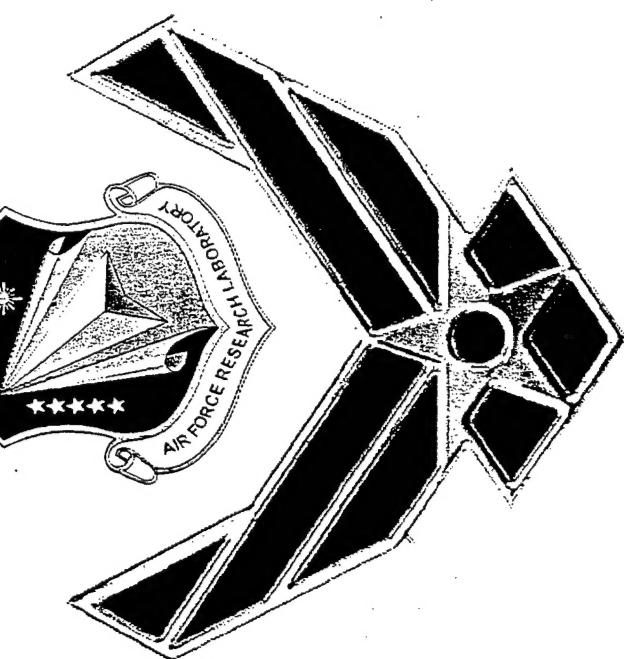
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APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL
Technical Advisor
Space and Missile Propulsion Division

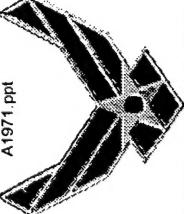
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HYBRID EXPERIMENTAL- NUMERICAL J-INTEGRAL ANALYSIS AND CRACK GROWTH RESISTANCE OF A PARTICULATE COMPOSITE MATERIAL



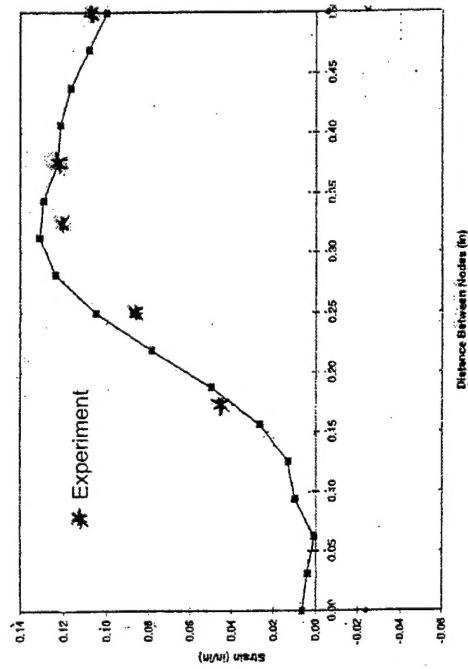
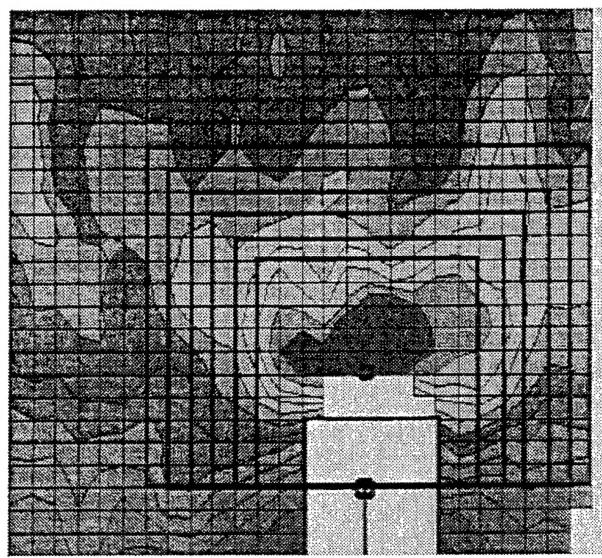
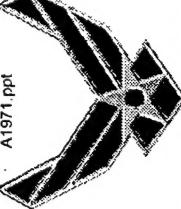
C.T Liu
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Javier Gonzalez
Clinical Micro Sensors
757 South Raymond Ave.
Pasadena, CA 91105



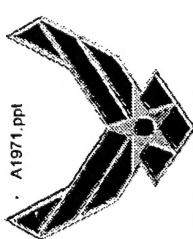
Objectives

- Investigate the Inhomogeneous Nature of the Microstructure.
- Determine J-Integral Using a Hybrid Experimental-Numerical Technique.
- Investigate Crack Growth Behavior.



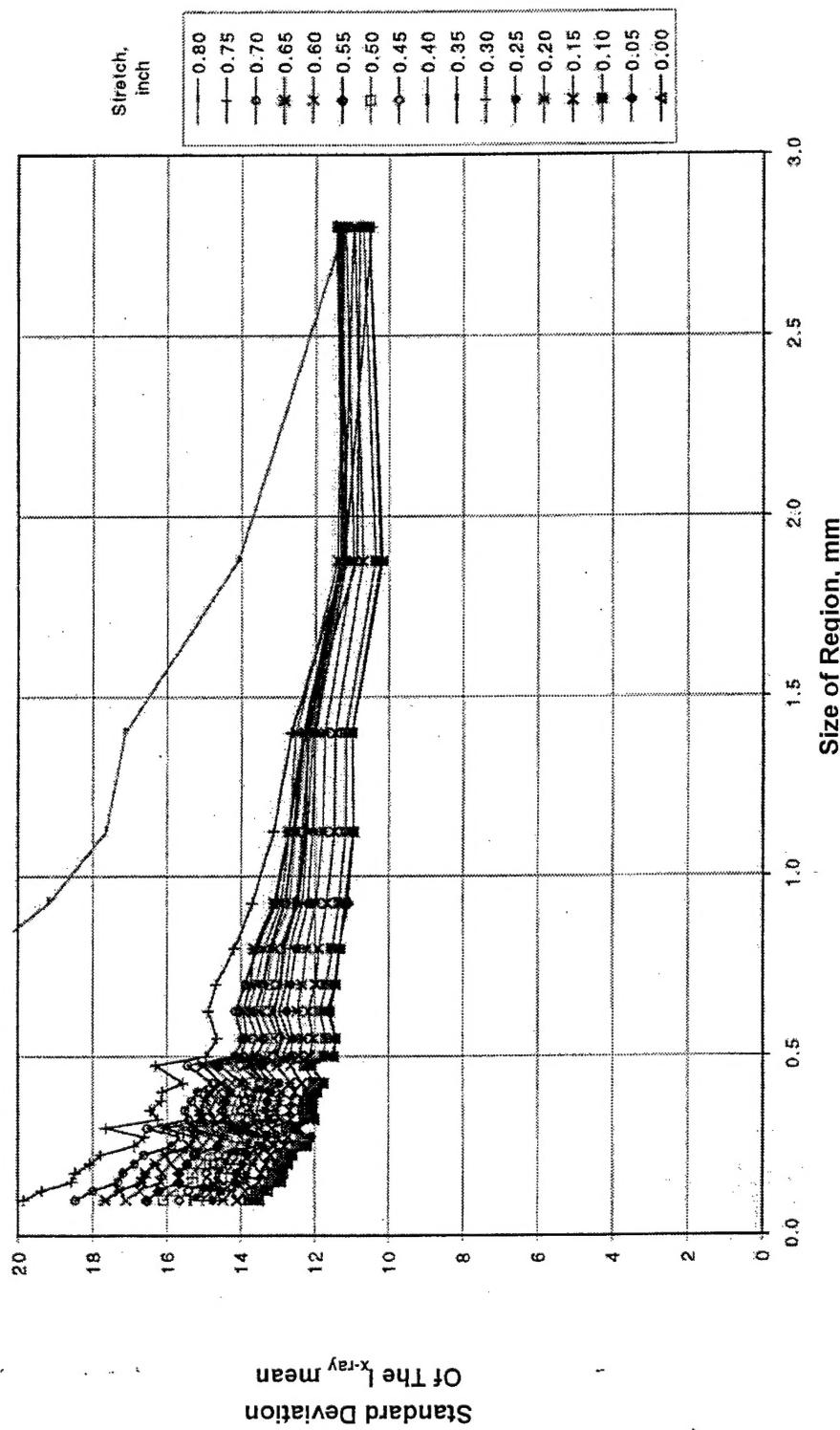
Strain Distributions and Integration Paths

Normal Strain Along a Integration Path



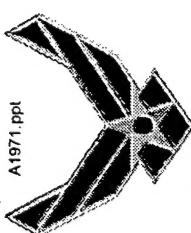
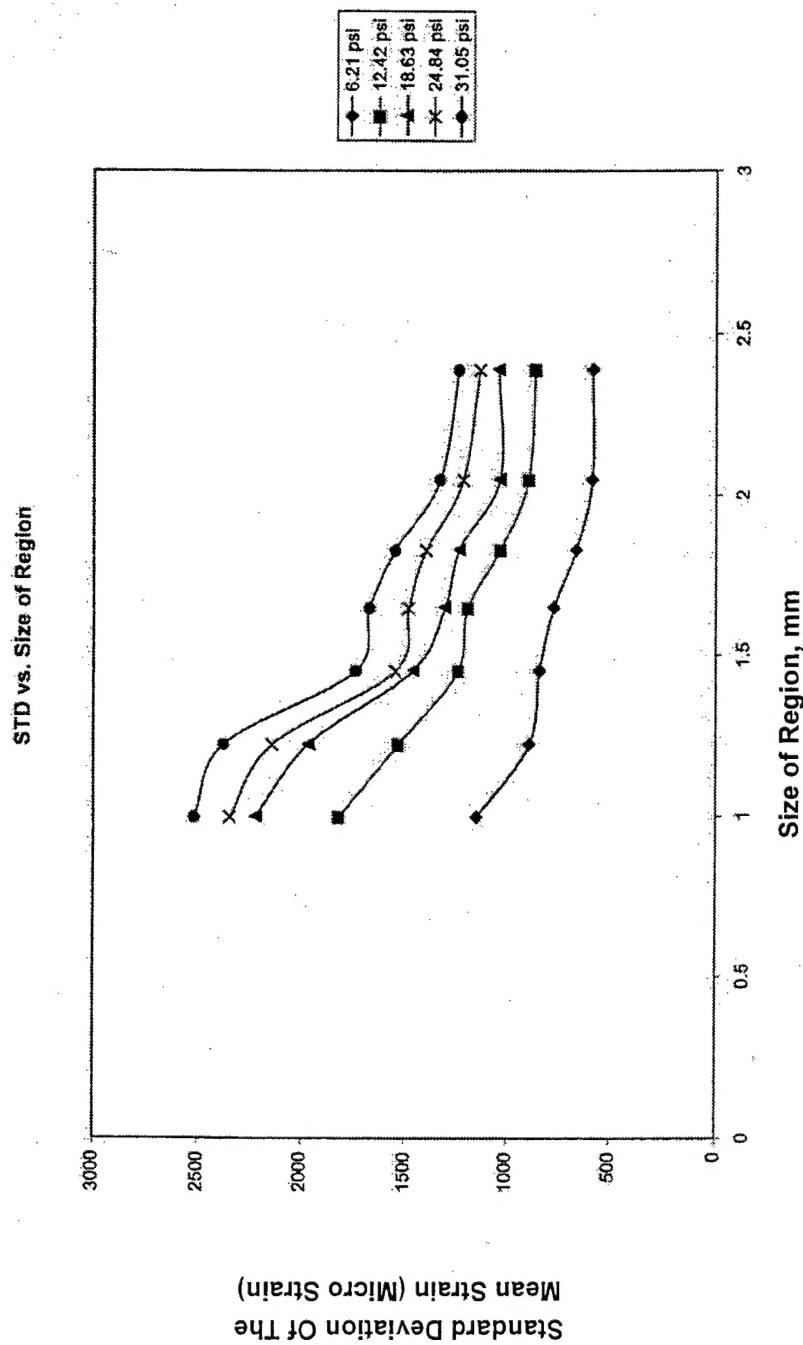
Standard Deviation of X-Ray Intensity Versus Size of Region as a Function of Applied Deformation

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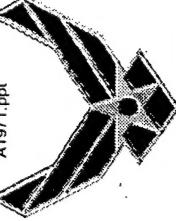




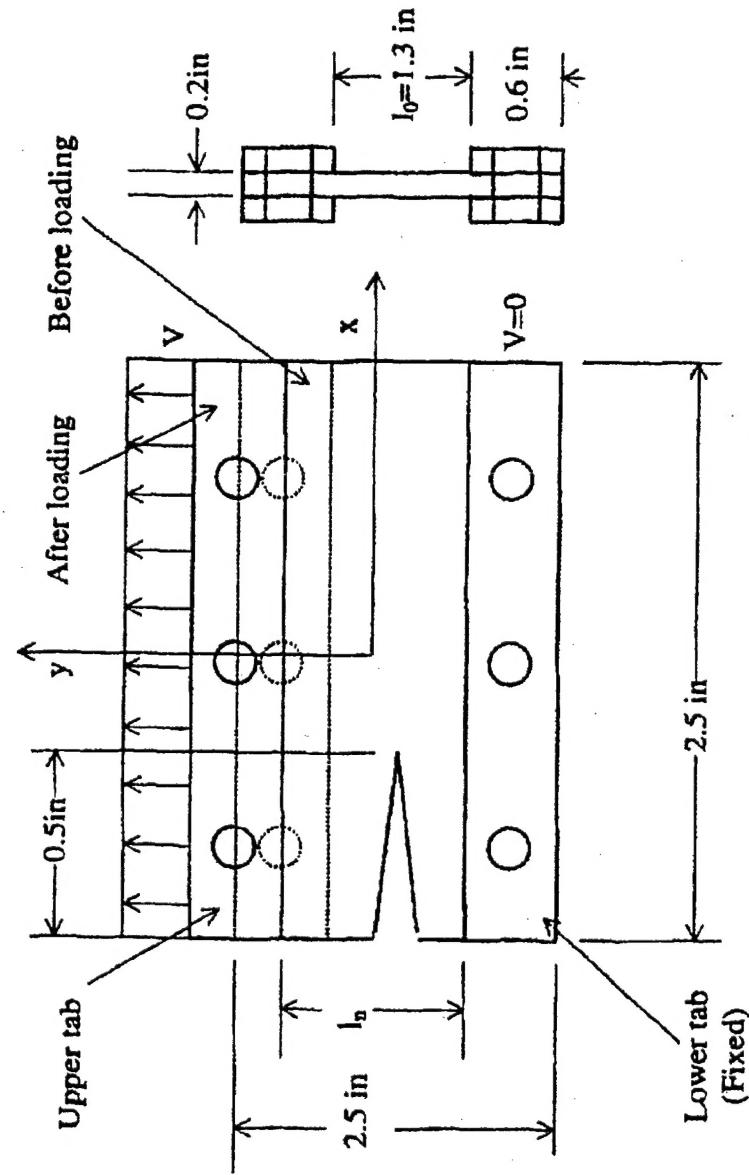
Standard Deviation of Strain Versus Size of Region as a Function of Applied Stress



Specimen Geometry

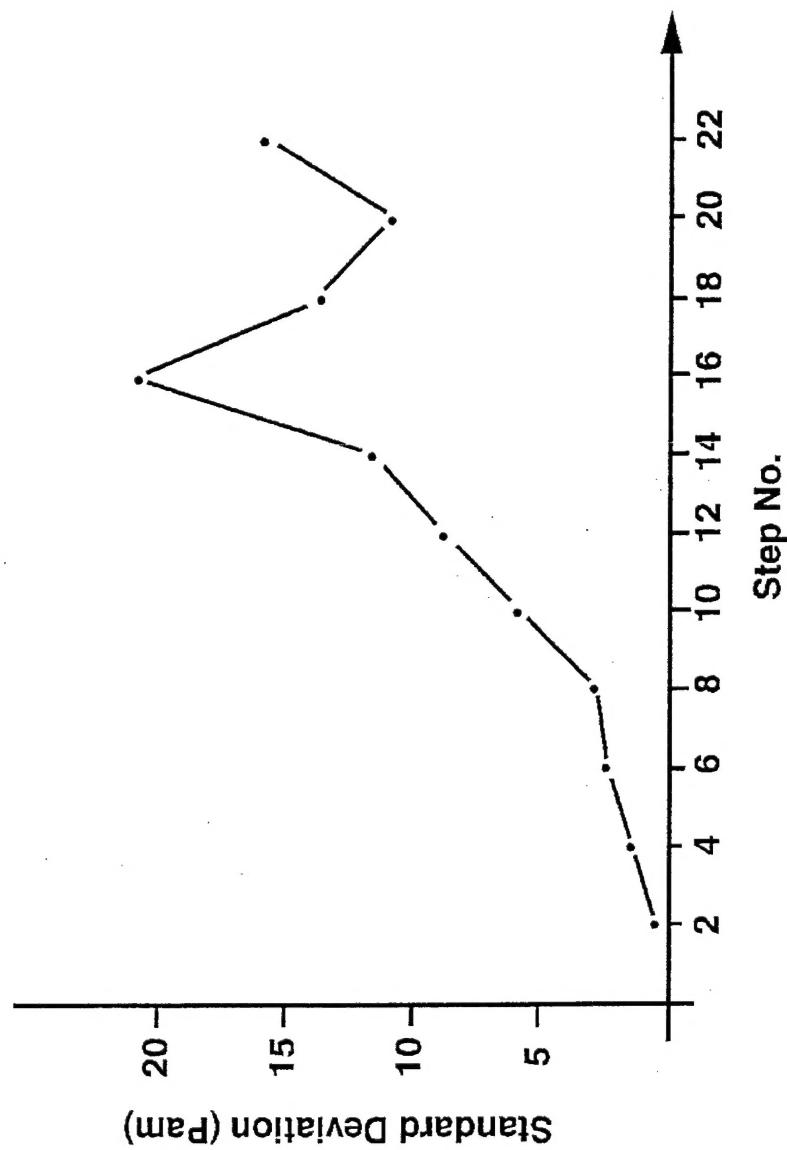
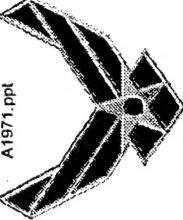


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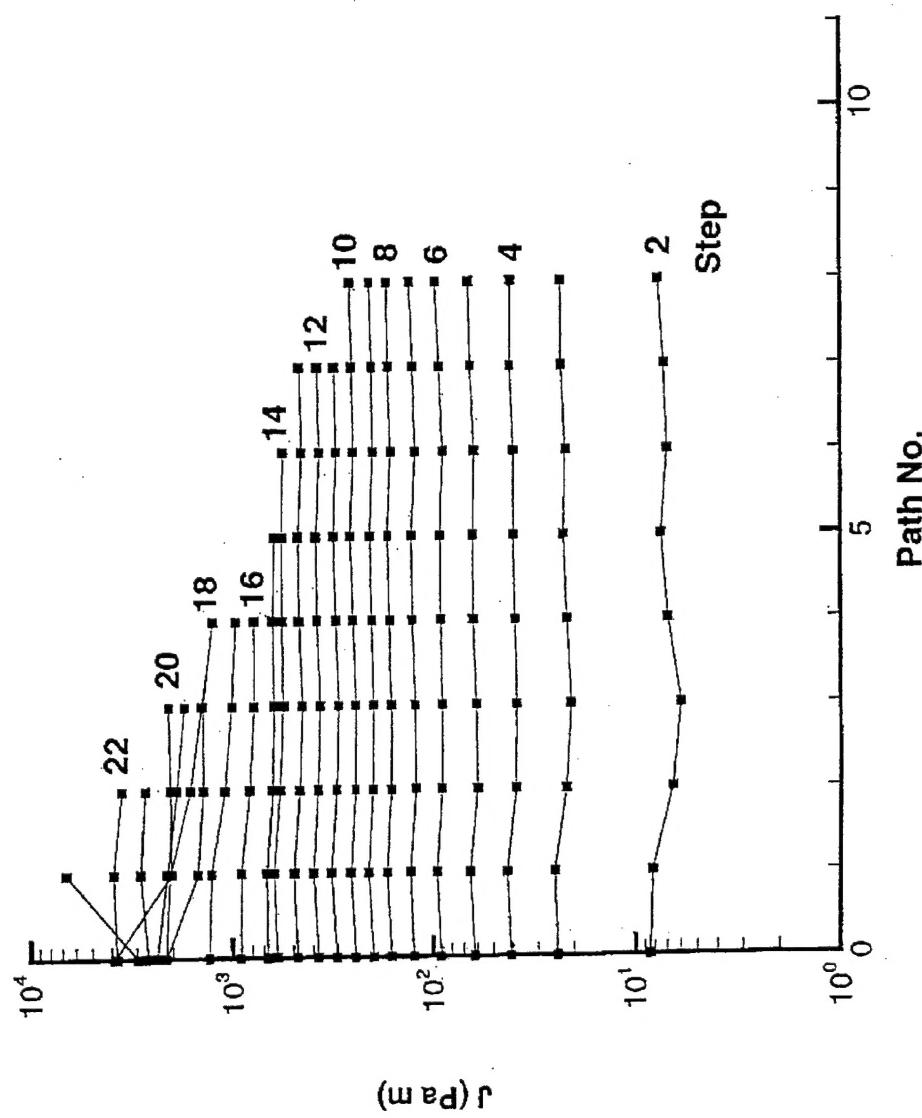
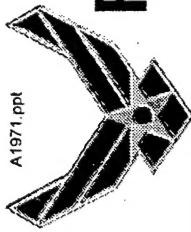


Standard Deviation of J-Integral Versus Step Number (Applied Strain)

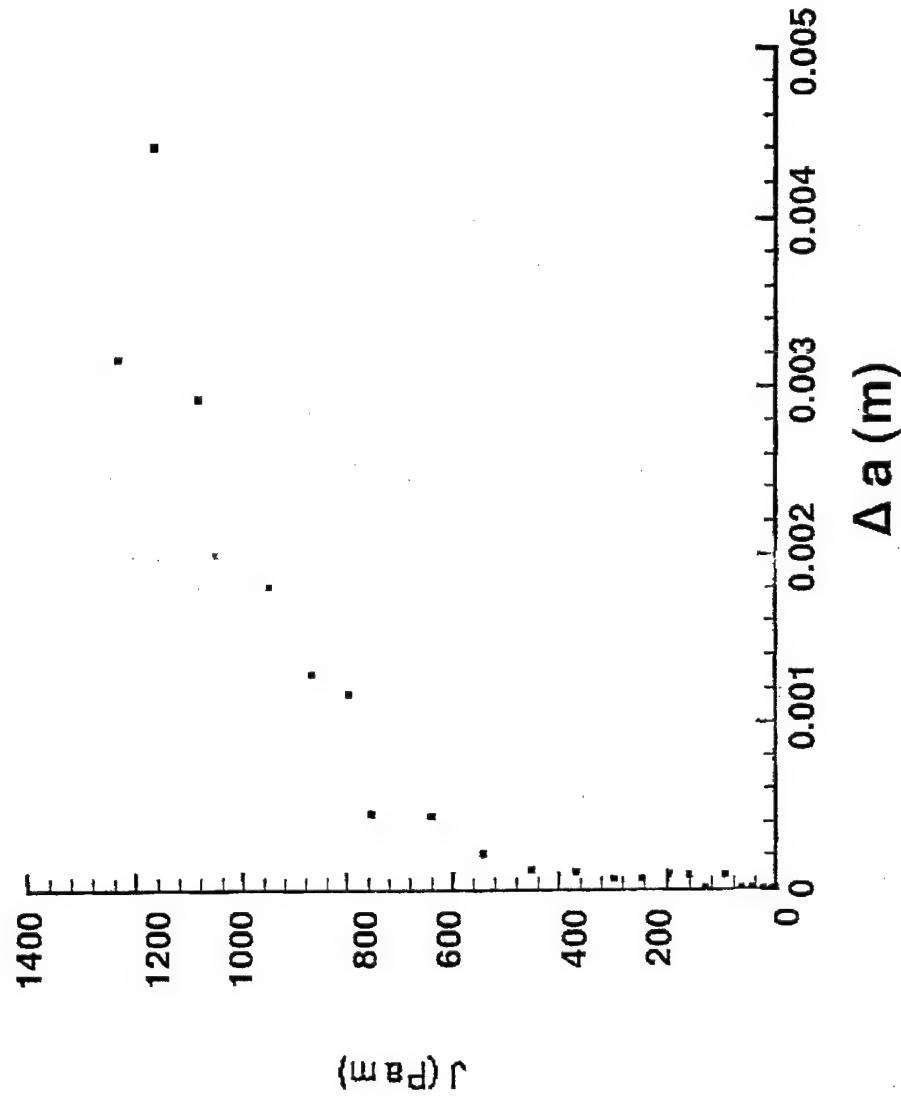




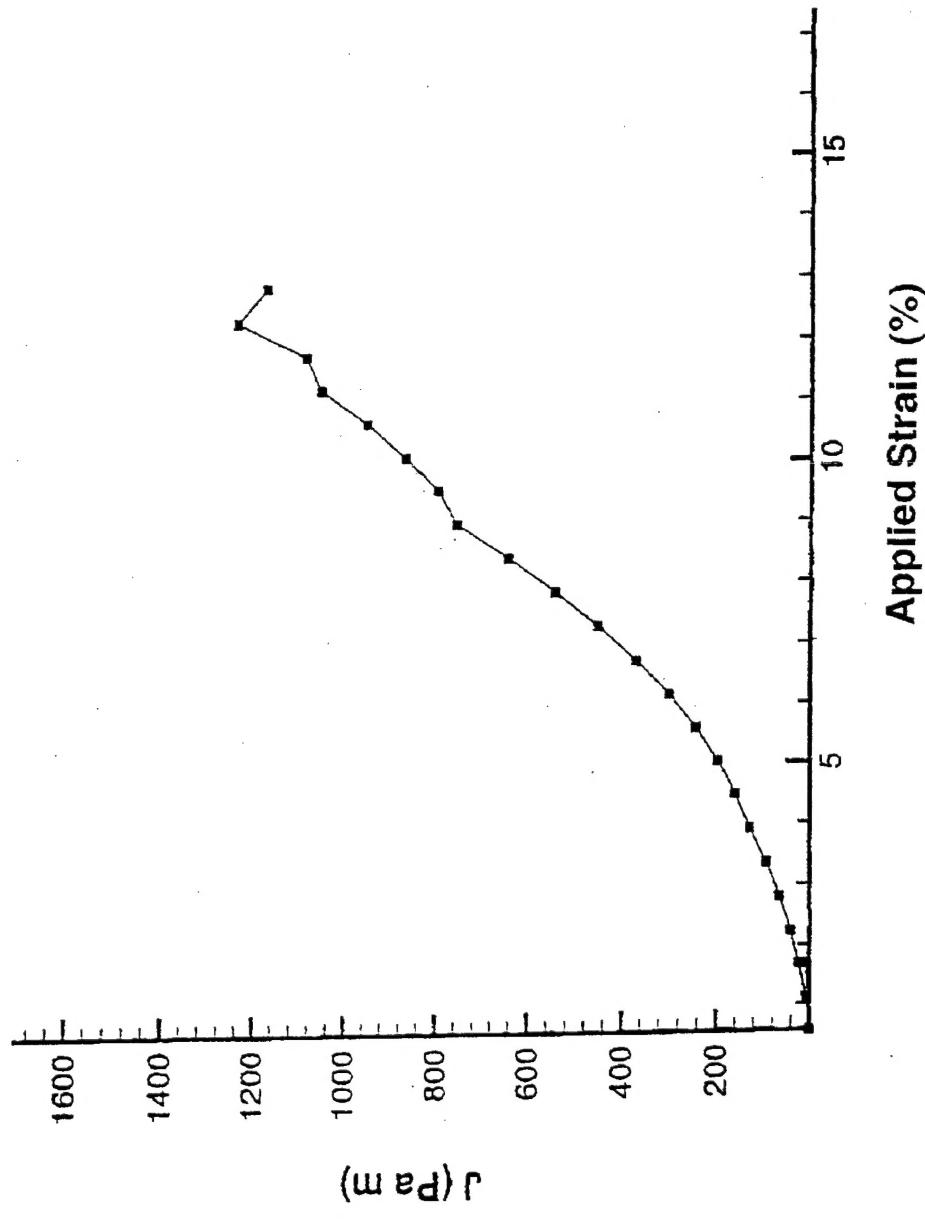
J-Integral Versus Path Number as a Function of Step Number (Applied Strain)



Crack Growth Resistance Curve

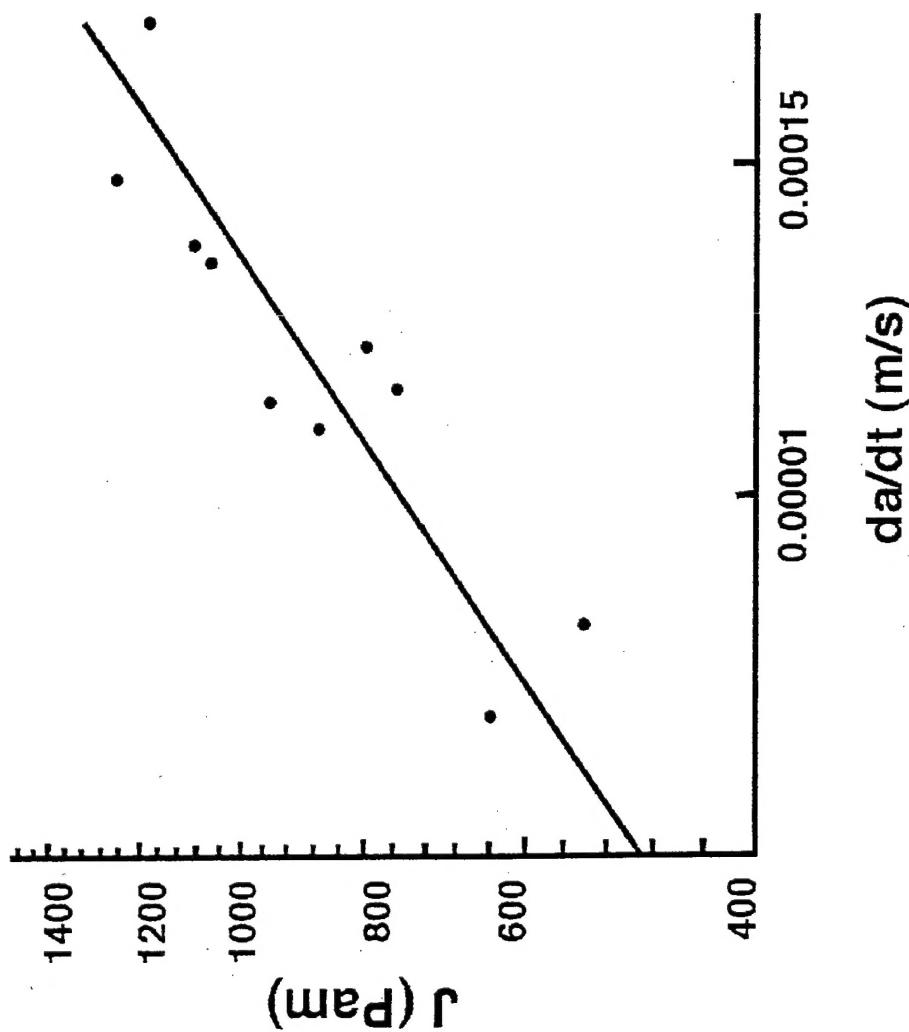
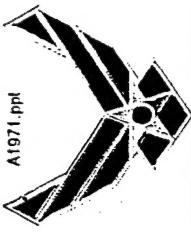


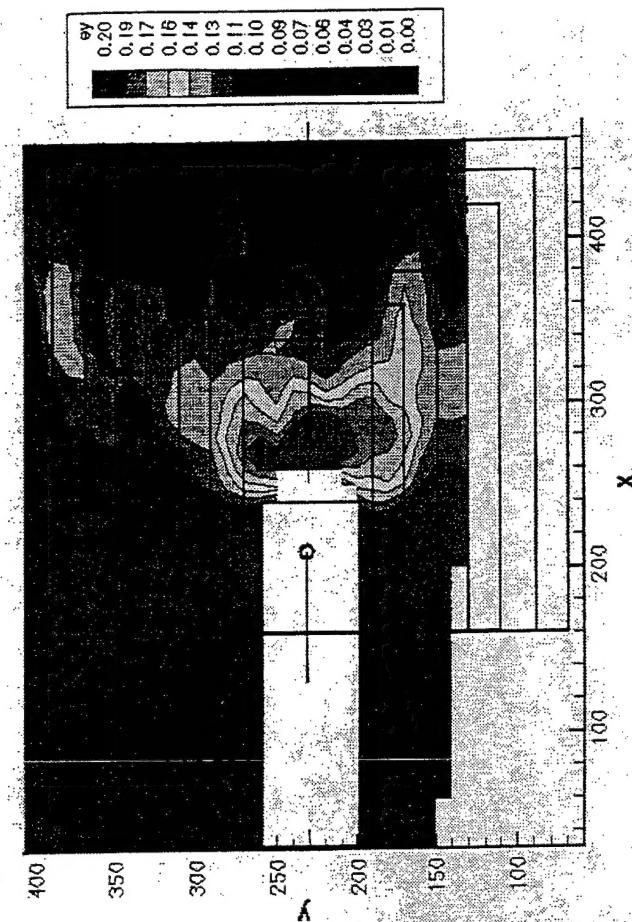
J-Integral Versus Applied Strain





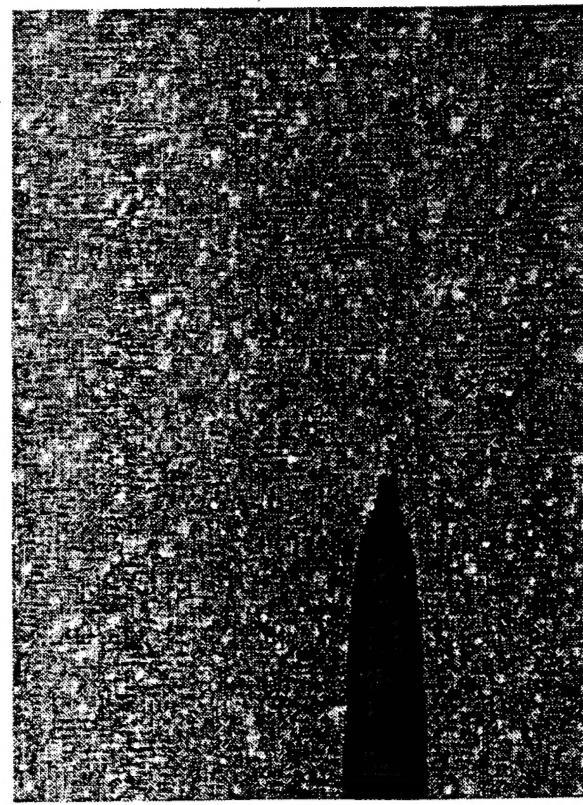
Crack Growth Rate Versus J-Integral





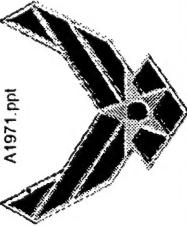
Strain Distributions and Integration Paths

Deformed Image



Conclusions

- The minimum area for a valid homogeneous continuum assumption of the particulate composite material is 2 mm x 2 mm.
- On the macroscopic scale, the J-Integral is independent of the integration path.
- A power law relationship exists between the J-Integral and the crack growth rate.



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